PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

COHAUSZ & FLORACK
Kanzlerstrasse 8a
D-40472 Düsseldorf
ALLEMAGNE

Date of mailing (day/month/year) 25 January 2002 (25.01.02)	
Applicant's or agent's file reference 990731WO	**IMPORTANT NOTIFICATION**
International application No. PCT/EP00/04147	International filing date (day/month/year) 10 May 2000 (10.05.00)

1. The following indications appeared on record concerning:

[X] the applicant　　[ ] the inventor　　[ ] the agent　　[ ] the common representative

Name and Address NOKIA NETWORKS OY Keilalahdentie 4 FIN-02150 Espoo Finland	State of Nationality FI	State of Residence FI
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person　　[X] the name　　[ ] the address　　[ ] the nationality　　[ ] the residence

Name and Address NOKIA CORPORATION Keilalahdentie 4 FIN-02150 Espoo Finland	State of Nationality FI	State of Residence FI
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office

[ ] the International Searching Authority

[ ] the International Preliminary Examining Authority

[X] the designated Offices concerned

[ ] the elected Offices concerned

[ ] other:

The International Bureau f WIPO 34, chemin d s Colombettes 1211 Geneva 20, Switzerland	Authorized officer Marie-Thérèse Priser
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Form PCT/IB/306 (March 1994)　　　　　　　　　　　　　　004620222

PATENT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:
COHAUSZ & FLORACK
Kanzlerstrasse 8a
D-40472 Düsseldorf
ALLEMAGNE

2 3 NOV. 2001

Date of mailing (day/month/year) 15 November 2001 (15.11.01)	
Applicant's or agent's file reference 990731WO	**IMPORTANT NOTICE**

International application No. PCT/EP00/04147	International filing date (day/month/year) 10 May 2000 (10.05.00)	Priority date (day/month/year)

Applicant NOKIA NETWORKS OY et al		

1. Notice is hereby given that the International Bureau has **communicated**, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this notice:
   KP,KR,US

   In accordance with Rule 47.1(c), third sentence, those Offices will accept the present notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
   AE,AG,AL,AM,AP,AT,AU,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,DZ,EA,EE,EP,ES,
   FI,GB,GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,
   MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,

   The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this notice is a copy of the international application as published by the International Bureau on

   15 November 2001 (15.11.01) under No. WO 01/86908

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a **demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination (at present, all PCT Contracting States are bound by Chapter II).

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the **national phase**, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and the PCT Applicant's Guide, Volume II.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.91.11

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

Applicant's or agent's file reference
(if desired) (12 characters maximum) 990731WO

Box No. I	TITLE OF INVENTION

METHOD FOR AN AUTOMATIC ASSIGNMENT OF IP ADDRESSES AND IP BASED NETWORK

Box No. II	APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

Nokia Networks Oy
Keilalahdentie 4
FI - 02150 Espoo
Finland

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State *(that is, country)* of nationality: FI	State *(that is, country)* of residence: FI

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III	FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

AALTO, Mika
Karl-Esser-Weg 5
D - 40882 Ratingen
Germany

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: FI	State *(that is, country)* of residence: DE

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV	AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☐ agent ☐ common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

COHAUSZ & FLORACK

Patent- und Rechtsanwälte (24)

Kanzlerstrasse 8a
40472 Düsseldorf
Deutschland

Telephone No.
+49 211 90 49 00

Facsimile No.
+49 211 90 49 049

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Continuation of Box No. III	FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

MAJOR, Tamas
Rethelstr. 1
D - 40233 Düsseldorf
Germany

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: FI	State *(that is, country)* of residence: DE

This person is applicant for the purposes of: ☐ all designated States   ☐ all designated States except the United States of America   ☒ the United States of America only   ☐ the States indicated in the Supplemental Box

---

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:

☐ applicant only

☐ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

This person is applicant for the purposes of: ☐ all designated States   ☐ all designated States except the United States of America   ☐ the United States of America only   ☐ the States indicated in the Supplemental Box

---

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:

☐ applicant only

☐ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

This person is applicant for the purposes of: ☐ all designated States   ☐ all designated States except the United States of America   ☐ the United States of America only   ☐ the States indicated in the Supplemental Box

---

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:

☐ applicant only

☐ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

This person is applicant for the purposes of: ☐ all designated States   ☐ all designated States except the United States of America   ☐ the United States of America only   ☐ the States indicated in the Supplemental Box

---

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No. V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) *(mark the applicable check-boxes; at least one must be marked):*

Regional Patent

☒ **AP ARIPO Patent:** **GH** Ghana, **GM** Gambia, **KE** Kenya, **LS** Lesotho, **MW** Malawi, **SD** Sudan, **SL** Sierra Leone, **SZ** Swaziland, **TZ** United Republic of Tanzania, **UG** Uganda, **ZW** Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT

☒ **EA Eurasian Patent:** **AM** Armenia, **AZ** Azerbaijan, **BY** Belarus, **KG** Kyrgyzstan, **KZ** Kazakhstan, **MD** Republic of Moldova, **RU** Russian Federation, **TJ** Tajikistan, **TM** Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT

☒ **EP European Patent:** **AT** Austria, **BE** Belgium, **CH** and **LI** Switzerland and Liechtenstein, **CY** Cyprus, **DE** Germany, **DK** Denmark, **ES** Spain, **FI** Finland, **FR** France, **GB** United Kingdom, **GR** Greece, **IE** Ireland, **IT** Italy, **LU** Luxembourg, **MC** Monaco, **NL** Netherlands, **PT** Portugal, **SE** Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT

☒ **OA OAPI Patent:** **BF** Burkina Faso, **BJ** Benin, **CF** Central African Republic, **CG** Congo, **CI** Côte d'Ivoire, **CM** Cameroon, **GA** Gabon, **GN** Guinea, **GW** Guinea-Bissau, **ML** Mali, **MR** Mauritania, **NE** Niger, **SN** Senegal, **TD** Chad, **TG** Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT *(if other kind of protection or treatment desired, specify on dotted line)* . . . .

National Patent *(if other kind of protection or treatment desired, specify on dotted line):*

☒ **AE** United Arab Emirates
☒ **AL** Albania . . . .
☒ **AM** Armenia . . . .
☒ **AT** Austria . . . .
☒ **AU** Australia . . . .
☒ **AZ** Azerbaijan
☒ **BA** Bosnia and Herzegovina . . . .
☒ **BB** Barbados
☒ **BG** Bulgaria . . . .
☒ **BR** Brazil . . . .
☒ **BY** Belarus . . . .
☒ **CA** Canada
☒ **CH and LI** Switzerland and Liechtenstein
☒ **CN** China . . . .
☒ **CR** Costa Rica . . . .
☒ **CU** Cuba . . . .
☒ **CZ** Czech Republic . . . .
☒ **DE** Germany . . . .
☒ **DK** Denmark . . . .
☒ **DM** Dominica
☒ **EE** Estonia . . . .
☒ **ES** Spain . . . .
☒ **FI** Finland . . . .
☒ **GB** United Kingdom
☒ **GD** Grenada
☒ **GE** Georgia . . . .
☒ **GH** Ghana . . . .
☒ **GM** Gambia
☒ **HR** Croatia . . . .
☒ **HU** Hungary . . . .
☒ **ID** Indonesia
☒ **IL** Israel . . . .
☒ **IN** India . . . .
☒ **IS** Iceland
☒ **JP** Japan . . . .
☒ **KE** Kenya . . . .
☒ **KG** Kyrgyzstan . . . .
☒ **KP** Democratic People's Republic of Korea . . . .
. . . .
☒ **KR** Republic of Korea . . . .
☒ **KZ** Kazakhstan . . . .
☒ **LC** Saint Lucia
☒ **LK** Sri Lanka

☒ **LR** Liberia
☒ **LS** Lesotho . . . .
☒ **LT** Lithuania
☒ **LU** Luxembourg
☒ **LV** Latvia
☒ **MA** Morocco . . . .
☒ **MD** Republic of Moldova . . . .
☒ **MG** Madagascar . . . .
☒ **MK** The former Yugoslav Republic of Macedonia . . .
. . . .
☒ **MN** Mongolia
☒ **MW** Malawi . . . .
☒ **MX** Mexico . . . .
☒ **NO** Norway
☒ **NZ** New Zealand . . . .
☒ **PL** Poland . . . .
☒ **PT** Portugal . . . .
☒ **RO** Romania
☒ **RU** Russian Federation . . . .
☒ **SD** Sudan
☒ **SE** Sweden
☒ **SG** Singapore
☒ **SI** Slovenia . . . .
☒ **SK** Slovakia . . . .
☒ **SL** Sierra Leone . . . .
☒ **TJ** Tajikistan . . . .
☒ **TM** Turkmenistan . . . .
☒ **TR** Turkey . . . .
☒ **TT** Trinidad and Tobago . . . .
☒ **TZ** United Republic of Tanzania
☒ **UA** Ukraine . . . .
☒ **UG** Uganda . . . .
☒ **US** United States of America . . . .
. . . .
☒ **UZ** Uzbekistan . . . .
☒ **VN** Viet Nam . . . .
☒ **YU** Yugoslavia . . . .
☒ **ZA** South Africa . . . .
☒ **ZW** Zimbabwe . . . .

Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet:

☒ **AG** Antigua and Barbuda . . . .
☒ **DZ** Algeria . . . .

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)*

See Notes to the request form

Box No. VI   PRIORITY CLAIM   ☐ Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application *(day/month/year)*	Number of earlier application	Where earlier application is:		
		national application: country	regional application:* regional Office	international application: receiving Office
item (1)				
item (2)				
item (3)				

☐ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office)* identified above as item(s): _____

* *Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.*

Box No. VII   INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used)* :	Request to use results of earlier search; reference to that search *(if an earlier search has been carried out by or requested from the International Searching Authority)*:
ISA /	Date *(day/month/year)* Number Country *(or regional Office)*

Box No. VIII   CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets:	This international application is accompanied by the item(s) marked below:
request : 4	1. ☒ fee calculation sheet
description (excluding sequence listing part) : 16	2. ☐ separate signed power of attorney
claims : 4	3. ☐ copy of general power of attorney; reference number, if any:
abstract : 1	4. ☐ statement explaining lack of signature
drawings : 4	5. ☐ priority document(s) identified in Box No. VI as item(s):
sequence listing part of description : _____	6. ☐ translation of international application into (language):
	7. ☐ separate indications concerning deposited microorganism or other biological material
Total number of sheets : 29	8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
	9. ☐ other *(specify)*:

Figure of the drawings which should accompany the abstract: Fig. 2	Language of filing of the international application: English

Box No. IX   SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Dr. Ralph Schippan
Patent Attorney (24)

─────────── For receiving Office use only ───────────

1. Date of actual receipt of the purported international application:		2. Drawings:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		☐ received:
4. Date of timely receipt of the required corrections under PCT Article 11(2):		☐ not received:
5. International Searching Authority (if two or more are competent): ISA /	6. ☐ Transmittal of search copy delayed until search fee is paid.	

─────────── For International Bureau use only ───────────

Date of receipt of the record copy by the International Bureau:

PCT

FEE CALCULATION SHEET
Annex to the Request

For receiving Office use only
International application No.
Date stamp of the receiving Office

Applicant's or agent's file reference	990731WO

Applicant

Nokia Networks Oy

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE . . . . EUR 102 | T

2. SEARCH FEE . . . . EUR 945 | S

International search to be carried out by ....

(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee

The international application contains _29_ sheets.

first 30 sheets . . . . EUR 409 | b1

_____ x .... ^^ | b2

remaining sheets   additional amount

Add amounts entered at b1 and b2 and enter total at B . . . . EUR 409 | B

Designation Fees

The international application contains _85_ designations.

_8_____ x _88_____ = EUR 704 | D

number of designation fees   amount of designation fee
payable *(maximum 8)*

Add amounts entered at B and D and enter total at I . . . . EUR 1.113 | I

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

4. FEE FOR PRIORITY DOCUMENT *(if applicable)* . . . . | P

5. TOTAL FEES PAYABLE . . . . EUR 2.160

Add amounts entered at T, S, I and P, and enter total in the TOTAL box | TOTAL

☐ The designation fees are not paid at this time.

MODE OF PAYMENT

☒ authorization to charge deposit account (see below)   ☐ bank draft   ☐ coupons

☐ cheque   ☐ cash   ☐ other *(specify)*:

☐ postal money order   ☐ revenue stamps

DEPOSIT ACCOUNT AUTHORIZATION *(this mode of payment may not be available at all receiving Offices)*

The RO: _EPO_ ☒ is hereby authorized to charge the total fees indicated above to my deposit account.

☐ *(this check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit)* is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

☐ is hereby authorized to charge the fee for preparation and transmittal of the priority document to the International Bureau of WIPO to my deposit account.

28000261	08.05.2000	
Deposit Account No.	Date *(day/month/year)*	Signature Dr. Schippan, Patent Attorney (24)

Form PCT/RO/101 (Annex) (January 2000)   *See Notes to the fee calculation sheet*

COHAUSZ & FLORACK · P. O. Box 33 02 29 · D-40435 Düsseldorf

VORAB PER TELEFAX

WIPO

34, Chemin d. Colombettes

CH-1211 Genf 20

Patentanwälte

Dipl.-Ing.	Rudolf Knauf
Dr.-Ing.	Ralph Schippan
Dipl.-Ing.	Andreas Thielmann
Dr. rer. nat.	Ralph Minderop
Dipl.-Ing.	Johannes Simons
Dipl.-Ing.	Hans-Joachim Meyer *
Dipl.-Phys.	Gottfried Schüll
Dr. rer. nat.	Thomas Rox
Dipl.-Ing.	Alexandra Weyres
Dr. rer. nat.	Arwed Burrichter
Dr. rer. nat.	Joachim Brunotte *

Rechtsanwälte

Erik Schäfer

Ulrike Alice Ulrich

Düsseldorf December 07, 2001

Your ref.

Our ref. SC/ar 990731WO

Internationale Patentanmeldung PCT/EP00/04147

Anmelderin: Nokia Networks Oy

Die Anmelderin hat mit Wirkung vom 01. Oktober 2001 ihren Namen geändert in:

Nokia Corporation.

Es wird gebeten, die Namensänderung **schnellstmöglich** vorzunehmen und das Formblatt PCT/IB/306 noch **vor dem 10. Januar 2002** zu übersenden da die Anmelderin die Nationalisierung gemäß Kapitel I vornehmen wird.

Dr. Ralph Schippan

Patentanwalt (24)

Encl.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 990731WO	**FOR FURTHER ACTION**	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/EP 00/ 04147	International filing date *(day/month/year)* 10/05/2000	(Earliest) Priority Date *(day/month/year)*

Applicant
NOKIA NETWORKS OY

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of ____2____ sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

   [ ] the text is approved as submitted by the applicant.

   [X] the text has been established by this Authority to read as follows:

   METHOD FOR AN AUTOMATIC ALLOCATION OF IP ADDRESSES

5. With regard to the **abstract,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.   2

   [X] as suggested by the applicant.   [ ] None of the figures.

   [ ] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

Form PCT/ISA/210 (first sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7   H04L29/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7   H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	R. DROMS: "RFC 1541, Request For Comments, Dynamic Host Configuration Protocol." RETRIEVED FROM THE INTERNET, AT WWW.IETF.ORG, XP002164347	1-4,6-12
Y	paragraph '0002! paragraph '0003! paragraph '03.1! figure 3	5,13,14

	-/--	

[X] Further documents are listed in the continuation of box C.   **[ ]** Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 March 2001	12/04/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Canosa Aresté, C

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PERKINS C E ET AL: "USING DHCP WITH COMPUTERS THAT MOVE" WIRELESS NETWORKS, ACM, US, vol. 1, no. 3, 1 October 1995 (1995-10-01), pages 341-353, XP000538245 ISSN: 1022-0038 paragraph '0002!	1-4, 6-12
X	D.E.COMER: "Internetworking with TCP/IP, Vol I: Principles, Protocols and Architecture, 3rd edition." 1995 , PRENTICE-HALL , US XP002164348 paragraph '21.9! paragraph '21.10! paragraph '21.11! paragraph '21.12!	1-4, 6-12
Y	PERLMAN R: "A COMPARISON BETWEEN TWO ROUTING PROTOCOLS: OSPF AND IS-IS" IEEE NETWORK, IEEE INC. NEW YORK, US, vol. 5, no. 5, 1 September 1991 (1991-09-01), pages 18-24, XP000248469 ISSN: 0890-8044 the whole document	5
Y	CHUL-JIN PARK ET AL: "The improvement for integrity between DHCP and DNS" PROCEEDINGS. HIGH PERFORMANCE COMPUTING ON THE INFORMATION SUPERHIGHWAY, XX, XX, 28 April 1997 (1997-04-28), pages 511-516, XP002110636 the whole document	13
Y	GUARENE E ET AL: "IP AND ATM INTEGRATION PERSPECTIVES" IEEE COMMUNICATIONS MAGAZINE, IEEE SERVICE CENTER. PISCATAWAY, N.J, US, vol. 36, no. 1, 1988, pages 74-80, XP000739155 ISSN: 0163-6804 the whole document	14

4

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL SEARCHING AUTHORITY

To:
COHAUSZ & FLORACK
Kanzlerstrasse 8a
40472 Düsseldorf
GERMANY

Eingang

1 2. APR. 2001

Frist bis: 12.06.01

Bearbeiter | Erledigt | Geschen

NOTIFICATION OF TRANSMITTAL OF
INTERNATIONAL SEARCH REPORT
OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing *(day/month/year)*	12/04/2001

Applicant's or agent's file reference	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
990731WO	

International application No.	International filing date *(day/month/year)*
PCT/EP 00/04147	10/05/2000

Applicant

NOKIA NETWORKS OY

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1. [X] The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

   When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

   Where? Directly to the   International Bureau of WIPO
   34, chemin des Colombettes
   1211 Geneva 20, Switzerland
   Fascimile No.: (41–22) 740.14.35

   For more detailed instructions, see the notes on the accompanying sheet.

2. [ ] The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. [ ] **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   [ ] the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

   [ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):**   The applicant is reminded of the following:

   Shortly after **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

   Within **19 months** from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

   Within **20 months** from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL–2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340-3016	Claude Berthon

Form PCT/ISA/220 (July 1998)

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international pbulication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When? Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been /is filed, see below.

How? Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the languag of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped),whether

    (i)   the claim is unchanged;

    (ii)   the claim is cancelled;

    (iii)   the claim is new;

    (iv)   the claim replaces one or more claims as filed;

    (v)   the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."

2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."

3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."

4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international appplication is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for International preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

· (12) INTERNATIONA   LICATION PUBLISHED UNDER THE PAT   COOPERATION TREATY (PCT)

(54) Title: METHOD FOR AN AUTOMATIC ALLOCATION OF IP ADDRESSES
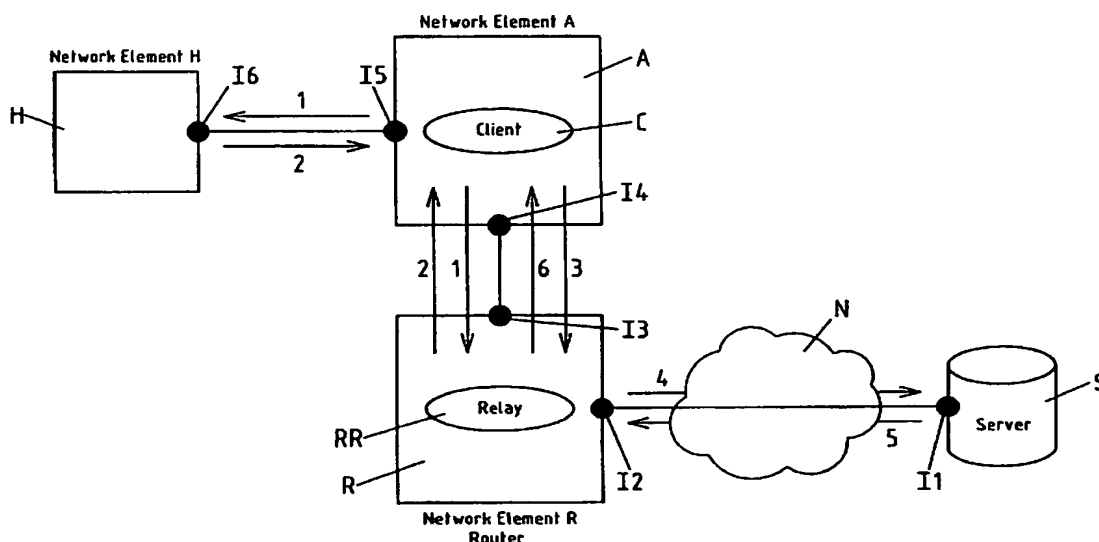
(57) Abstract: The invention relates to a method for an automatic assignment of IP addresses to the interfaces of network elements having at least two interfaces, by one of which they are newly connected, either directly or via other network elements, to a server of an IP based network. To minimise the necessary manual configuration when a network element with at least two interfaces is newly connected to an IP based network, under following steps are proposed: checking by said network element, which of its interfaces is connected to the server; said network element sending a configuration request via its interface linked to the server; the server of the network receiving the request, choosing and reserving as many IP addresses as needed for the new network element, and sending out a response with said IP addresses to the new network element; the new network element receiving said IP addresses and applying them on its interfaces requiring an address.

Method for an automatic assignment of IP addresses and IP based network

The invention relates to a method for an automatic
assignment of IP (internet protocol) addresses to the
interfaces of network elements, especially routers,
having at least two interfaces, by one of which they are
newly connected, either directly or via other network
elements, to a server of an IP based network. The
invention equally relates to an IP (internet protocol)
network comprising at least one server and network
elements with more than one interface. It is understood
that an IP address may be an IP host address, identifying
one dedicated IP host, as well as an IP network address.

The use of networks based on the internet protocol (IP)
are well known in the state of the art. Such networks are
built up of different network elements, two important
element types in a typical IP based network being hosts
and routers. Servers may be included to serve the
different network elements. A host constitutes the access
for a user and has typically one interface, which
connects the host to a logical IP subnetwork (LIS), i.e.
the host is a member of the LIS. A member of a LIS can
send IP packets directly to all other members of the same
LIS. If a network element wants to communicate with other
network element and the two network elements are not
members of a same LIS, then there must be one or more
routers between the two LISs. A router is a network
element, which forwards IP packets between different
LISs. Typically a router has more than one physical

interface, because the LISs typically represent also
physically separated networks. The physical networks
connected by the routers represent subnetworks of the
whole IP network, and normally each subnetwork has its
own network address.

Every host in an IP based network is assigned an IP
address. The address format is comprised of a network
address and a local or host address. The network address
identifies the IP subnetwork to which the host is
attached. The local address is a unique local address
within the IP subnetwork. Using the IP addresses, two
hosts on the same IP subnetwork can send packets directly
to each other. Two hosts on different IP subnetworks
cannot send IP packets directly to each other, instead
the packets have to go via the router connecting the two
subnetworks. For the routers, there can be provided an IP
address for every interface, the IP address being
composed again of the network address of the subnetwork,
to which the interface belongs, and of a local address
identifying the interface in the subnetwork. All
interfaces with a dedicated IP address are numbered
interfaces. For the interfaces which belong to a point-
to-point link to other network elements, the assignment
of a dedicated IP address is possible but not necessary,
i.e. these interfaces may be numbered or unnumbered.

Typically, an IP network has a large number of hosts and
the number of hosts in each subnetwork can change.
Equally, the number of other network elements can vary,
for example, the number of routers when new subnetworks
are to be added. In addition, the available IP address
space is usually limited and should be used efficiently.
In order to take such developments into account, the IP

network needs human intelligence when it comes to
planning.

In the state of the art, the Dynamic Host Configuration
Protocol (DHCP) is used for configuring new network
elements with only one interface, especially hosts, with
information from DHCP servers, which maintain a database
with IP addresses. A new host searches a DHCP server and
requests an IP address. In case there is a router between
the host and the DHCP server, the router must have DHCP
relay functionality. This method reduces the work
necessary to administer an IP network. It is not known,
however, how to facilitate the assignment of IP addresses
and IP network addresses to new network elements with
more than one interface.

It is an object of the invention to provide a method and
an IP based network which minimise the necessary manual
configuration when a network elements with at least two
interfaces, in particular a router, is newly connected to
an IP based network.

This object is reached on the one hand with the method of
claim 1.

On the other hand, the object is reached by an IP
(internet protocol) network comprising at least one
server and network elements with more than one interface,
in particular routers, which are suitable for employing
the method according to one of claims 1 to 7.

The invention proceeds from the idea that, if the IP
network has some known restrictions, the automatic
assignment of IP addresses to network elements with more
than one interface is essentially facilitated. The

invention is applicable in networks that do not require hierarchical addressing, e.g. because they are rather small. Moreover, the number of network elements has to be limited and known.

Based on those two restrictions, the method and the IP network of the invention decrease the required amount of planning in an IP based network to a minimum, because it enables the server to automatically choose and reserve IP addresses for a newly connected network element upon request by the network element. Since the distribution of the IP addresses can be carried out efficiently by the server, the address space for the addresses can be set to the minimum needed for the defined maximum number of interfaces.

Advantageous embodiments of the invention can be taken from the subclaims.

In the method according to the invention, the new network element can be connected directly to the server. Alternatively, the new network element, in particular routers, can be connected to the server via other network elements with also at least two interfaces. The other network elements comprise a relay function for the address reservation protocol, the relay function knowing the location, especially the IP address, of the server. Therefore, the other network elements are able to forward the configuration request from the new network element and the response from the server correctly. The two alternatives provide in combination a method suitable for an expansion at any location of the existing IP based network.

The new network element with more than one interface, in particular the router, may start its relay functionality after one first interface is provided with an IP address. The IP address can be dedicated to an interface in case numbered links are used. If numbered links are used, the IP address is not tied to any interface in particular.

Moreover, there might be provided a possibility to include additional information or parameters in the server's response beside the IP address, in particular by the server itself. This has the benefit that more details for the IP configuration of the new network elements or some other parameters for the new network element can be transmitted at the same time. Configurations not to be used for the whole network but being specific to a subnetwork can be achieved by including additional data by the relay of a network element the response has to pass.

In order to be able to exchange routing information, the routers of the network should run a routing protocol, in particular an Open Shortest Path First (OSPF) routing protocol.

If the new network element comprises interfaces for numbered links, in particular for Logical IP Subnetworks (LIS), the new network element requests an IP network address for each of those interfaces from the server. For the interfaces, that are already connected to existing routers, there is no need for such a request.

If the new network element only comprises interfaces for unnumbered links, the new network element preferably requests only one IP host address from the server.

In order to be useable according to the claimed methods,
in a preferred embodiment of the IP network of the
invention each network element with more than one
interface comprises a client for checking if its
interfaces are connected, directly or via another network
element, to the server and for sending a configuration
request to the server. Those network elements further all
comprise a relay for forwarding configuration requests
coming in via one of the interfaces via another one of
the interfaces. The server of the network comprises means
for choosing and reserving IP addresses for a network
element newly included in the network in response to a
received configuration request from this new network
element.

In another preferred embodiment of the invention, the IP
network uses the Dynamic Host Configuration Protocol
(DHCP) for assigning IP addresses to the interfaces of
new network elements, especially to IP hosts. The use of
the DHCP may be in addition to the claimed methods. This
is in particular applicable, when the interface to the
existing router is numbered.

Preferably, the server of the IP network of the invention
has access to a database, especially a database
maintained by the server, indicating which IP addresses
are allocated and which IP addresses are available.

With such a database, the server immediately knows, which
addresses can be chosen and reserved for new network
elements. If a network element is removed from the IP
network, the IP addresses of the concerned interfaces
should be identified as being available again for future
allocations.

In a preferred embodiment of the IP network of the
invention the at least one server of the network moreover
has access to a database, in particular a DNS (domain
name service) database, in which the distributed IP
addresses are put into relation with a generic name of
the element to which the IP address is assigned. This
way, the different interfaces can be addressed easily by
a generic name.

In an equally preferred embodiment of the IP network of
the invention, the network is made up of point-to-point
links between the network elements.

The application of the method of the invention can be
seen especially with IP networks using ATM as data link
layer. Accordingly, the IP network according to the
invention is preferably an IP over ATM network. Still,
other suitable networks can used as well.

In the following, the invention is explained in more
detail with reference to drawings, of which

Fig. 1   shows an ATM network based on IP to which the
          method of the invention is applicable;

Fig. 2   shows a part of an IP network with newly connected
          components;

Fig. 3   shows a method according to the invention for one
          of the newly connected components of Fig. 2; and

Fig. 4   shows a preferred extension of the method of
          Fig. 3.

In figure 1, an IP network according to the invention can
be seen. The components of the network are a server S,
and, as network elements, a plurality of routers R,A and
a plurality of hosts H. Each host H has one interface,
each router at least two interfaces. The server S is
located at a central place and connected to one of the
routers R. All routers R,A that are not connected
directly to the server S are connected to the server S
via other routers R. Router A with interfaces I_a to I_d has
been newly connected to the network.

The network elements are connected either by a point-to-
point link or by a Local Area Network (LAN) L, the IP
network comprising several of such subnetworks L. To each
subnetwork there is assigned an IP network address, which
forms part of each IP address of the interfaces belonging
to the respective subnetwork. If numbered point-to-point
links are used between routers and the LANs have several
hosts, then the operator may not want to assign as large
IP networks for the point-to-point links as for LANs. The
operator may in that case define two subnetwork pools:
small subnetworks for point-to-point links and larger
subnetworks for LANs. The router requesting a new IP
network from the server would then have to know whether
it requests a LAN subnet or a point-to-point subnet for
an interface. To simplify the server configuration it is
therefore preferred to use unnumbered links between
routers (i.e. only one pool). On the other hand, if the
LANs have one or two hosts, then the subnet size in a LAN
and a numbered point-to-point link could be same and one
pool would be enough.

The server S is configured accordingly with a pool of
subnetworks, all being able to hold the desired number of
connected network elements.

Because the server has to know whether a router requests
a new IP network for a LAN subnetwork or a point-to-point
subnet it is simpler to use only unnumbered links between
routers.

In every network element R,A,H there is included a client
functionality. The client of a network element newly
connected to the existing network is able to request IP
addresses for its interfaces. The request is either sent
to a router R or a server S connected by a point-to-point
link to the requesting network element or broadcast to
every node connected to the same subnetwork, depending on
the connection of the new network element. Thus the
request is received by all directly connected network
elements. Each client of a network has an unique
identifier (node ID), which enables other elements to
identify each client individually. With each request, the
node ID is send, such that the request can be associated
with the requesting client.

In each network element with more than one interface,
i.e. especially in routers, moreover a relay function is
integrated. Such a functionality is needed, whenever the
client of a network element cannot reach the server S
directly. The task of the relay is to listen to all
interfaces of its network element, and to take note if
there are incoming requests from a connected network
element. A received request is directly addressed and
sent to one or more servers. The relay may add additional
information to the request in order to enable the server
S to send the response to the client.

The server S receives a request from a client of a new
network element, either directly or via the relay
functionality of another network element, chooses an

address, reserves it and sends it to the requesting
client. The server also updates a DNS database to which
it has access, so that the clients can easily be
addressed by name.

If a network element has a point-to-point connection to
another network element, an unnumbered link can be used.
This means that the link does not have an IP network
address and therefore the interfaces do not have to have
IP addresses. If the connection between network elements
is not a point-to-point connection, but for example a LAN
with hosts, a network address is needed for the link and
the interfaces of the routers have to have IP addresses.

The configuration of the new router A depends on the kind
of links between the routers.

In the network of figure 1, if the links between the
routers are unnumbered, the interfaces Ia, Ib and Id of
the new router A can be configured to be unnumbered and
interface Ic is configured as LIS interface. If it is
known that the server can be found only behind an
unnumbered link, the new router can try to find the
server sending "server discovery" messages to the
unnumbered links Ia, Ib, Id, an answer arriving via
interface Ia. The router A can then requests IP host
addresses or IP network addresses from the server S,
depending on the other interface types. The server S can
provide any free address from a pool of available
addresses. Alternatively, the server S can be configured
to provide dedicated addresses according to a node ID in
the request message.

In the case of figure 1, the new router A will only
request a network address for interface Ic. Other

addresses are not necessary, because the router A can use
the IP address in interface Ic. The new router A
configures the received IP addresses according to the
answer from the server S and starts the relay function,
which will serve other network elements below this router
A. The relay function must add to the relayed requests
information, which identifies the unnumbered interface
from where the request came. The answer from the server S
should include the same information so that the relay can
forward the answer to the correct client.

If on the other hand the links between the routers are
numbered, all interfaces Ia,Ib,Ic,Id of a new router A
are numbered as well. First, the router uses a
conventional method (DHCP) to obtain an IP address for
the interface that leads towards the server. To this end,
the router tries all interfaces Ia,Ib,Ic,Id and the DHCP
server answers via interface Ia. Thereafter, the new
router A can start reserving network addresses for the
other interfaces Ib,Ic,Id. Preferably, a new router A
always requests network addresses for the same size of
networks for all of the interfaces Ib,Ic,Id. This way,
the server does not have to keep pools of different sizes
of network. When the router A has received the network
addresses for the remaining interfaces, it configures the
addresses to the interfaces and start its relay function.
In this case, the relay function can use the same method
to identify the interface of requests and answers as a
DHCP relay function, because all links have IP network
addresses.

The method relating to numbered links between routers
employed in the network of figure 1 will be better
understood with the following explanations to figures 2
to 4.

Figure 2 shows a part of a network like the one in figure
1, comprising a server S, a router R, a new router A and
a host H. The server S is provided with several
configured interfaces, the only one relevant in this
example being referred to in Figure 2 as I1. The server S
has moreover access to a DNS database, not shown in the
figure, in which reserved IP addresses are assigned to
the name of the client belonging to the host for which
they are reserved. The router R has at least two
configured interfaces I2 and I3 and a relay function. The
router A also comprises at least two interfaces I4, I5.
The host H is provided with only one interface I6. The
router A and the host H both have a client C
functionality. In the beginning, the interfaces I4, I5,
I6 of router A and host H are not configured. The shown
interface I1 of the server S is connected to interface I2
of the router R. The router R is connected by its
interface I3 to interface I4 of the router A. Interface
I5 of the router A, finally, is connected to the only
interface I6 of the host H.

The router A has just been connected to the router R of
the existing IP network and was switched on. Just the
same, the host H has newly been connected to the router
A.

Figure 3 schematically illustrates the steps of the
method of the invention applied to the situation depicted
in Figure 2.

Each component of Figure 2 is represented by a vertical
dotted line. From left to right, the vertical lines are
assigned to the host H, the network element A, the router
R and the server S.

The horizontal arrows between the vertical lines
represent the messages exchanged between the different
components.

The proceedings according to the method of the invention
applied to the IP network of Figure 2 is now explained
with reference to Figure 3.

The client functionality C of the network element A
checks, which of its interfaces I4,I5 are useable. Since
the network is an ATM network, the presence of a cell
sync on interface I4 indicates that there is another
element at the end of the link. Moreover, the client
functionality C checks, whether the elements reachable
via interfaces I4 are configured or unconfigured by using
an address resolution message (e.g. InATMARP) to evaluate
the state. The signalling between network element A and
host H on the one hand and network element A and router R
on the other hand necessary for the checking is indicated
in Figures 2 and 3 with the numbers 1 and 2 representing
a first step 1 and a second step 2 carried out during the
described procedure.

Interface I3 of the router R is recognised by network
element A via interface I4 as being configured, interface
I6 of the host H is recognised by the network element A
via interface I5 as being not configured. In consequence,
the client functionality C of the network element A sends
a configuration request via interface I4 to interface I3
of the router R (step 3).

A relay RR running on the router R receives the request
and forwards it to the server S including the IP address
of the router's interface I3 (step 4).

The server S chooses an IP address that can be assigned
to the interface I4 of the new network element A. One
part of the address is necessarily the address of the
subnetwork of the router's R interface I3 that was added
by the relay RR of router R to the forwarded
configuration request. The other part is one of a defined
number of addresses provided for the particular
subnetwork and which is not yet in use. The server S
maintains for this purpose a database in which is stored
for each subnetwork which addresses are allocated and
which are still available. The database equally provides
information on which subnetworks are allocated and which
are still available.

The server S outputs a response including the chosen IP
address via its interface I1 (step 5). The server may
include other configuration parameters for the network
element A in the response. In addition, the server S
updates the DNS database so that the new network element
A can be addressed by name.

The relay RR of the router R receives and forwards the
response of the server S to the network element A via the
interfaces I2 and I3 (step 6). Also at this point,
additional configuration data relevant for the particular
subnetwork may be included in the response to the new
network element A.

The new network element A receives the response and
applies the IP address included in the response on the
used interface I4. In case other parameters had been
included in the server's S response, they are also
utilised for configuration.

The new network element A can now start its relay functionality RA, as depicted in Figure 4.

The network element A checks, if one of its interfaces I5 currently not supplied with an IP address could be in usage. It recognises or knows that interface I5 (steps 7 and 8) is numbered, but the subnet address is not yet allocated. A configuration request for interface I5 is therefore sent via the local relay RA of the network element A (step 9) and the connected network N, which may consist of a plurality of routers R (step 10) to the server S, the routers R not being shown in this figure. The configuration request indicates that a new subnetwork has to be used. The server S first chooses and reserves an address for a new subnetwork that is still available according to a consultation of the proper database. Thereafter, the server S chooses and reserves an IP address for interface I5, composed of the address of the new subnetwork and of a part identifying the interface I6 within the new subnetwork and sends it back via the network N and the relay RA of network element A to the interface I5 (step 11). The IP address chosen by the server S is applied to interface I5, this interface I5 being configured as well thereupon.

In the following, interface I6 of the host H still has to be configured. The host H recognises by a check with an InATMARP message that interface I5 of the network element A is configured and sends a configuration request to the server S via the relay RA of the network element A. This time, the relay RA of the network element A includes the address of the subnetwork of its interface I5 in the request. The further proceeding is the same as described for the configuration of the first interface I4 of the network element A.

In order to enable the operator to watch over the address usage in the network, there is provided a documentation tool.

CLAIMS

1. Method for an automatic assignment of IP (internet protocol) addresses to the interfaces of network elements (A), especially routers, having àt least two interfaces (I4,I6), by one of which they are newly connected, either directly or via other network elements (R), to a server (S) of an IP based network, characterised in that the method comprises the steps of:

a) checking by said new network element (A), which of its interfaces (I4,I5) is connected to the server;

b) said new network element (A) sending a configuration request via its interface (I4) linked to the server;

c) the server (S) of the network receiving the request, choosing and reserving as many IP addresses as needed for the new network element (A), and sending out a response with said IP addresses to the new network element (A);

d) the new network element (A) receiving said IP addresses and applying them on its interfaces requiring an address.

2. Method according to claim 1, characterised in that the new network element (A) is connected to the server (S) via other network elements (R), said other network elements (R) comprising at least two interfaces and a relay function for the address reservation protocol, the relay function knowing the location in particular the IP address of the server (S).

3. Method according to claim 1, characterised in that the new network element (A) starts its relay

functionality after at least one IP address or IP network address has been assigned.

4.   Method according to claim 1, characterised in that additional information or parameters are included in the server's (S) response to a configuration request from a new network element (A) beside the IP address, either by the server (S) or by the relay (R) of a network element (R) the response has to pass.

5.   Method according to claim 1, characterised in that all network elements of the network that are routers run a routing protocol to exchange routing information in particular an Open Shortest Path First(OSPF) routing protocol.

6.   Method according to claim 1, characterised in that if the new network element comprises interfaces for numbered links, in particular for Logical IP Subnetworks (LIS)the new network element requests an IP network address for each of those interfaces from the server (S).

7.   Method according to claim 1, characterised in that if the new network element only comprises interfaces for unnumbered links, the new network element requests only one IP host address from the server (S).

8.   IP (internet protocol) network comprising at least one server (S) and network elements (A) with more than one interface, characterised in that said network elements (A) are suitable for employing the method according to one of claims 1 to 7.

9.   IP (internet protocol) network according to claim 8,
characterised in that
each network element (A) with more than one interface
(I2,I3) comprises a client (C) for checking if its
interfaces (I4,I5) are connected directly or via another
network element (R) to the server (S) and for sending a
configuration request to the server (S), in that each
network element (R) with more than one interface (I2,I3)
comprises a relay (RR) for forwarding configuration
requests coming in via one of the interfaces (I3) via
another one of the interfaces (I2), and in that the
server (S) comprises means for choosing and reserving IP
addresses for a network element (A) newly included in the
network in response to a received configuration request
from this new network element (A).

10.   IP network according to claim 8, characterised in
that it is suitable for using the Dynamic Host
Configuration Protocol (DHCP) for assigning IP addresses
to the interfaces of the new network elements (H), in
particular to IP hosts.

11.   IP network according to claim 8, characterised in
that the network is made up of point-to-point links
between the network elements (S,H,R).

12.   IP network according to claim 8, characterised in
that the server (S) has access to a database, in
particular a database maintained by the server indicating
which IP addresses are allocated and which IP addresses
are available.

13.   IP network according to claim 8, characterised in
that the server (S) has access to a database, in
particular a domain name service (DNS) datbase, in which

all reserved IP addresses are related to the name of the network element (A) to which the IP address is assigned.

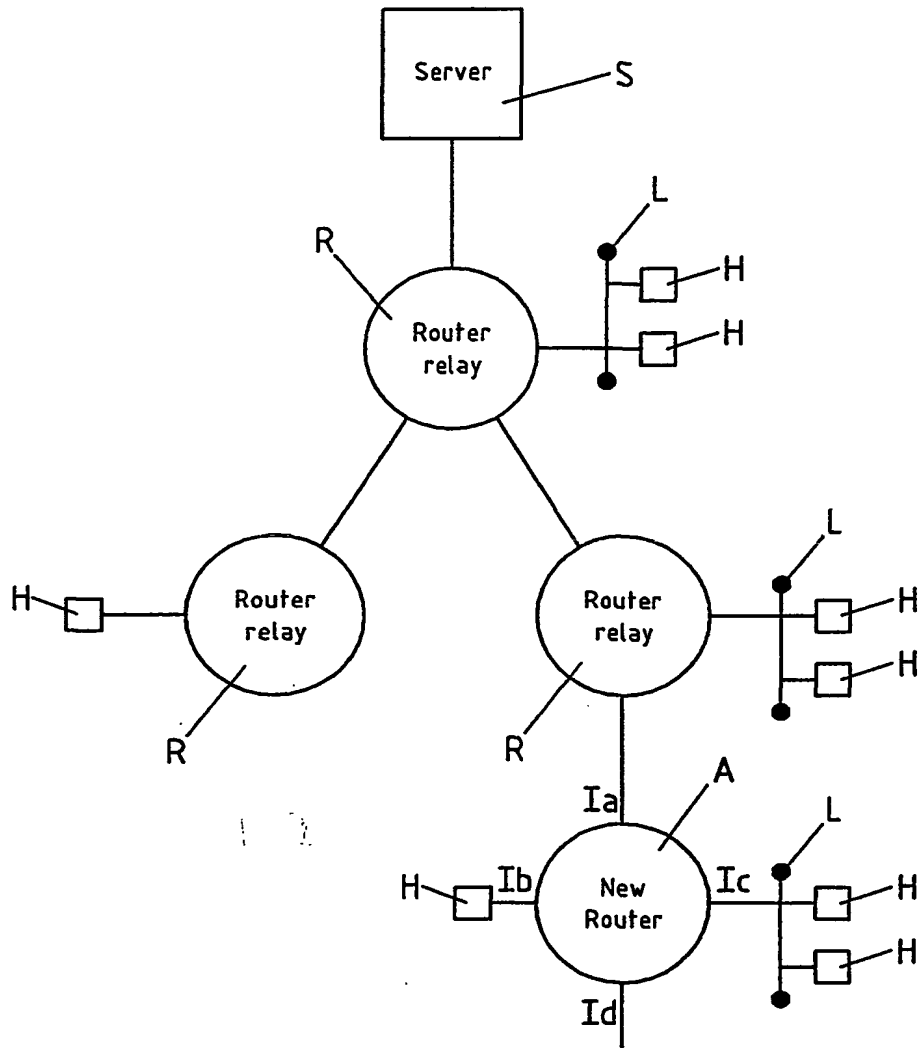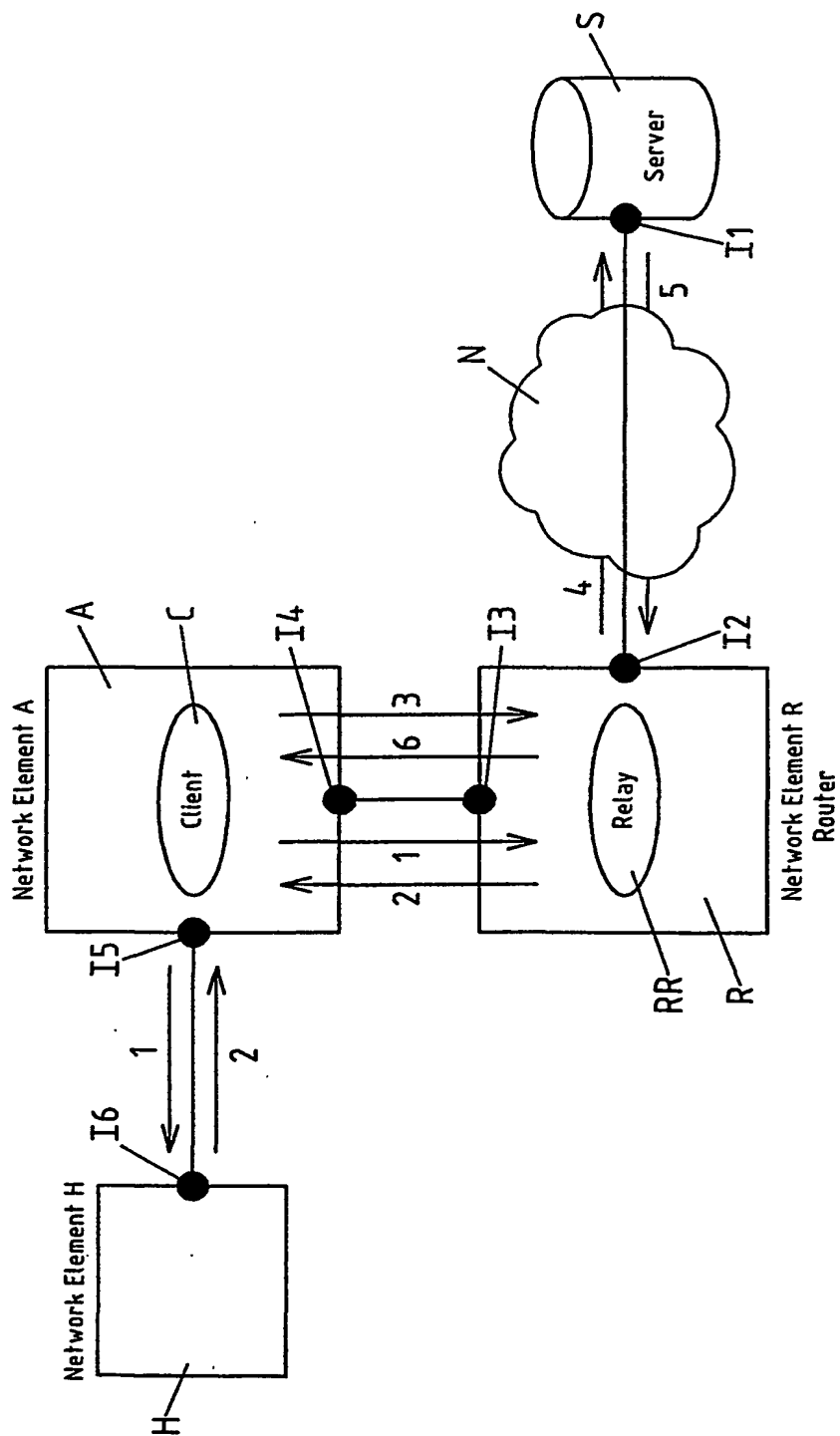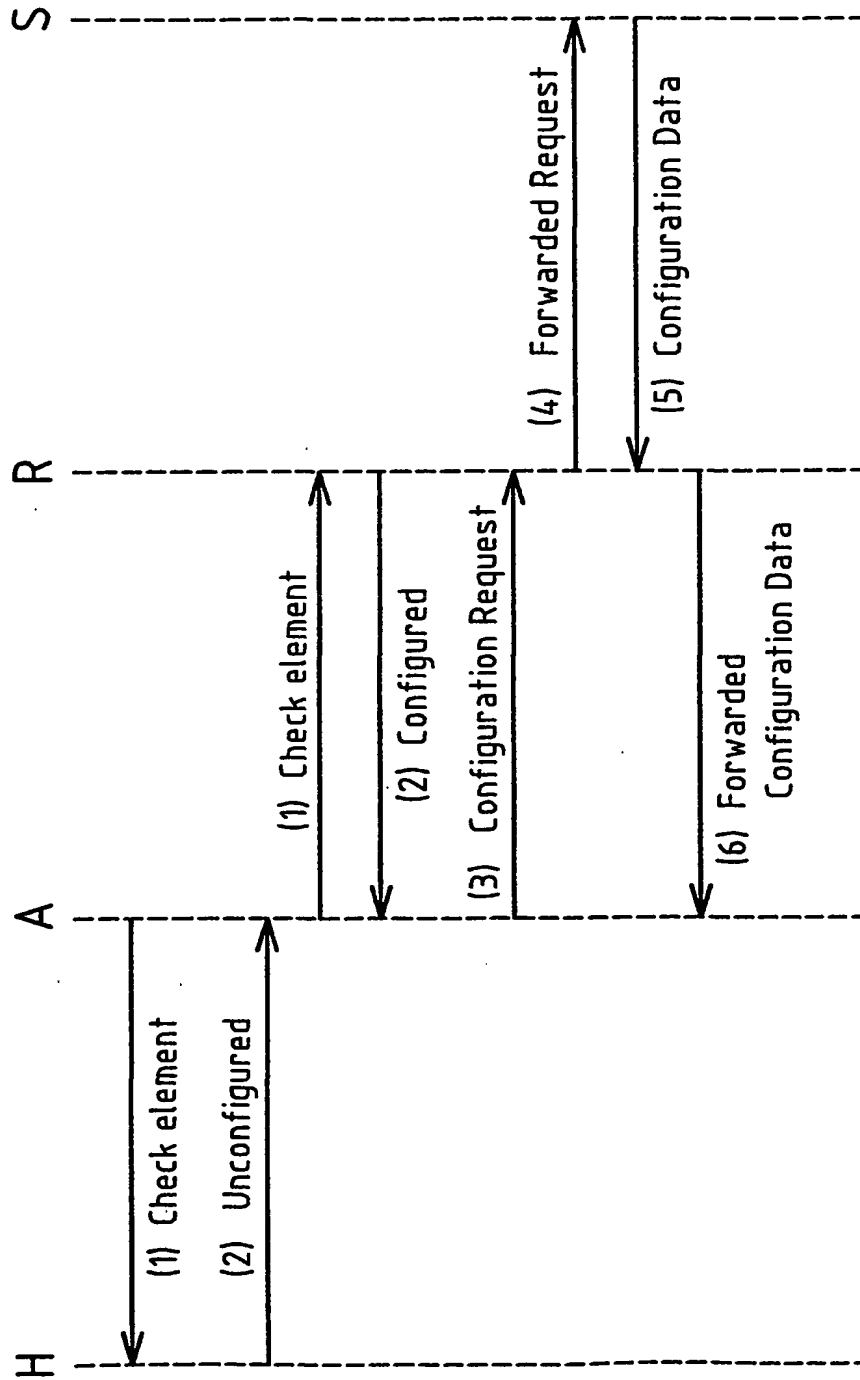14. IP network according to claim 8, characterised in that ATM is used as data link layer.
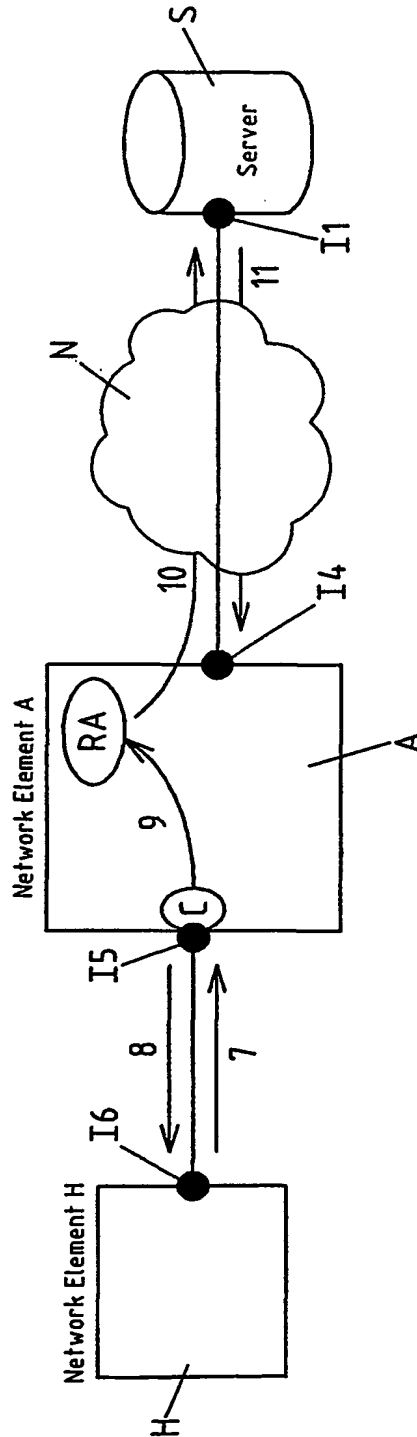
Fig.1

Fig.2

Fig.3

Fig.4

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7   H04L29/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7   H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	R. DROMS: "RFC 1541, Request For Comments, Dynamic Host Configuration Protocol." RETRIEVED FROM THE INTERNET, AT WWW.IETF.ORG, XP002164347	1-4,6-12
Y	paragraph '0002! paragraph '0003! paragraph '03.1! figure 3 ——	5,13,14
	-/--	

[X] Further documents are listed in the continuation of box C.

[ ] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 March 2001	12/04/2001

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